

## THE IMPACT OF PRODUCTIVITY INCREASING IN INDONESIAN MARITIM SECTOR: GENERAL EQUILIBRIUM ANALYSIS

**Widyastutik**

Bogor Agricultural University  
widyastutik\_ipb@yahoo.com

### **Abstract**

*The increase in productivity in the maritime sector will realize the maritime sector as a prime mover. This study aims to analyze the impact of the maritime sector productivity improvement on the performance of the economy. This research simulates increased productivity in the maritime sector (consisting of the fisheries, oil, gas sub-sector and marine transport services sector) using the Global Trade Analysis Project (GTAP) version 8. Simulation analysis showed an increase in productivity in the maritime sector has a positive impact on welfare, real GDP, and trade balance of Indonesia. However, the impact of the increase in productivity is not followed by an increase in output in all sectors. This indicates that if the increase in productivity occurs only in the maritime sector alone without being followed by an increase in productivity in other sectors, the sectoral performance is not optimal.*

**Keywords:** Maritime sector, productivity, General Equilibrium Analysis

### **Abstrak**

Peningkatan produktivitas di sektor maritim akan mewujudkan sektor maritime sebagai penggerak utama. Penelitian ini bertujuan menganalisis dampak peningkatan produktivitas sektor maritime terhadap kinerja perekonomian. Dengan menggunakan Global Trade Analysis Project (GTAP) versi 8 dilakukan simulasi peningkatan produktivitas pada sektor maritime (terdiri dari sub sektor perikanan, minyak, gas bumi, dan sektor jasa transportasi laut). Hasil analisis menunjukkan simulasi peningkatan produktivitas di sektor maritime berdampak positif bagi welfare, GDP riil, dan neraca perdagangan Indonesia. Namun, dampak peningkatan produktivitas ini tidak diikuti oleh peningkatan output diseluruh sektor. Hal ini mengindikasikan bahwa apabila peningkatan produktivitas hanya terjadi pada sektor maritime saja tanpa diikuti oleh peningkatan produktivitas di sektor lainnya maka kinerja sektor belum optimal.

**Kata Kunci:** Sektor Maritim, Produktivitas, Analisis Keseimbangan Umum

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## **INTRODUCTION**

World economic growth has an implication on increasing economic activities in the Asia Pacific region. This region is predicted to be a leader for other regions in the next two decades (World Economic Forum, 2001). One of the sectors that contribute to economic growth in the region is maritime sector which will be the prime mover (Kusumastanto, 2014). The control of the marine becomes a determining factor in the international arena because factually most of the earth's surface is a marine. In line with the predictions of the WEF (2001), Indonesia, Philippines and Japan as an island nation located in the Asia Pacific region have an important role in the growth in this region (Asian Development Bank and World Bank, 2000). This economic potency becomes strategic value, in line with the shifting center of world economic activity since the end of the 20th century from the Atlantic to Asia-Pacific. Trade of Asia-Pacific countries is nearly 70 percent of total world trade and more than 75 percent of traded goods transported by marine, especially through the Malacca Strait, Lombok Strait, Makassar Strait, and other marine in Indonesia.

Not only at the APEC level but also at the ASEAN level, the maritime sector is one of the 12 sectors defined as a priority sector (fisheries sector, e-travel, e-ASEAN, automotive, logistics, wood-based industries, rubber-based industry, furniture, food and beverages, footwear, textiles and textile products, and health) in order to meet the ASEAN Economic Community (AEC) in 2015. As the consequences of the AEC implementation in 2015, ASEAN becomes a single market for goods and services that enhance the production network and the capacity of ASEAN as a global production center and part of the global value chain. Indonesian maritime sector is potential as a mode of transportation that integrates national to international markets.

The importance of the maritime sector on the economy can be seen from the contribution of this sector to GDP. Based on BPS (2014), the fisheries sub sector is second contributor to GDP in the agricultural sector in the amount of 20.69 percent. While the contribution of this sector to GDP of Indonesia in 2012-2013 is amounted to 2.97 percent. This contribution does not include services related to the fisheries sector as well as oil and gas offshore. PKSPL-IPB study (2000) the marine sector is accounted 20.06 percent share of GDP by including the marine and brackish fisheries sub-sector; oil and gas; maritime industry (petroleum refining, LNG, other maritime

industry); marine transportation services and support services; marine tourism; marine construction and other marine services. The contribution of the maritime sector is still relatively low compared with some countries such as China, the US, and Norway where this sector's contribution to GDP was more than 30 percent (Kusumastanto, 2014).

**Table 1. Infrastructure Quality Index of Indonesian Seaport and ASEAN countries**

Negara	2007	2008	2009	2010	2011
Brunei		4.97	4.83	4.48	4.4
Kamboja	3.42	3.35	3.50	3.90	4
Indonesia	2.66	3.04	3.40	3.62	3.6
Malaysia	5.72	5.71	5.52	5.58	5.7
Philipina	2.82	3.16	3.00	2.76	3
Singapura	6.83	6.78	6.78	6.76	6.8
Thailand	4.65	4.42	4.69	5.03	4.7
Vietnam	2.77	2.83	3.28	3.60	3.4

Source: *World Development Indicator*, 2013

In addition to the potency of natural resources, in the context of international trade, the maritime sector is highly potential as a transportation mode of both trade in goods and services in the regional and international market. Shipping is the major mode of supply for world exports and imports. Efficient and competitive international maritime transport services are therefore vital for a productivity world economy. Policies or practices restricting competition and inflating the costs of international maritime transport services or reducing the quality of services can therefore have a significant impact on the world economy and could seriously undermine the economy-wide gains from broader microeconomic reform and trade liberalisation (Kang and Findlay, 2005). However, many obstacles hamper the potencies including inadequate Indonesian port capacity to accommodate the growth in trade of bulk or container. The waiting time for the container in Tanjung Priok in July and August 2011 was 6 days. This performance is lower compared to other ports in Southeast Asia such as Singapore (1.1 days), Malaysia (4 days), and Thailand (5 days) (Salcedo and Sandee,

2012). This worse condition also happens in other terminals in Indonesia. Increasing of the waiting time at the port has negative impact on the economy.

In linewith the study ofRay(2008), results of LPEMUI(2005) shows thecost of marine transport in Indonesia is veryinefficient, whereas95percentof international tradeis done through sea transportation modes. High transport costs are caused by unfavorable logistics conditions. Based on the Logistics Performance Index (LPI) in 2012, the quality of Indonesia's infrastructureis ranked 85 with a score of 2.54, while the customs is ranked 75 with a score of 2.53. This index is much lower than the 5 other ASEAN countries. The high costs of logistics in Indonesia is not only caused by the high cost of land and sea transportation, but also due to other factors related to the regulatory, human resources, process and management logistics that are not efficient, and the lack of professionalism of the actors and national logistics service providers resulting in inefficient domestic courier services (Lembito, 2013). This condition is in line with the quality index of Indonesian sea port infrastructure that is relatively lower compared to Malaysia and Singapore (See Table I.). Research conducted Limao et al. (2000) showed that the increase in the quality of infrastructure can reduce transportation costs by 40 percent for the country surrounded by sea and 60 percent for land locked countries. Efficiency in port reduces shipping costs more than 12 percent, equivalent to a distance of 5000 Miles. The continue Impact is the ease of export-import in Indonesia has left behind from Malaysia and Singapore. In 2005-2009, Indonesian exporters take 23 days to complete five documents export requirements. In 2011, it takes a shorter time that is 20 days, but a cost is relatively more expensive that is US \$ 704 / container than previous year that is US \$ 626 / container. For comparison Singapore only requires 4 export documents that can be completed within 5 days at a cost of US\$ 424/container. Malaysia requiress even documents export with a period of 18 days at a cost of US\$ 435.6 (Panjaitan, 2013).

Ease business environment must be supported by a competitive port services. Climate of fair competition will be able to realize a modern port services and global competitiveness. The influx of investment will lead to the modernization of port facilities, improvement of the quality of port service performance. Hertel et al. (2001) use CGE analysis to quantify the impact on trade of greater standards harmonization for e-business and automating customs procedures between Japan and Singapore. They

find these reforms will increase trade flows between these countries as well as their trade flows with the rest of the world.

The influx of investment also provides multiplier effects in other sectors, so that the expectations of the higher national economic growth will be achieved. Research by Limao et al. (2000) showed the increase in the quality of infrastructure can reduce transportation costs by 40% for the country that is surrounded by sea and 60% for land locked countries. Efficiency in port reduces shipping costs more than 12%, equivalent to a distance of 5000 Miles. This is evidenced by China, where rapid growth in the transportation sector since 1990 becomes supporting infrastructure in international trade. Regulatory reform affects the production of the transportation services sector. Port capacity increased from 300 million tons in 1985 to 2.9 billion tonnes in 2005. In 2011 the Port of Shanghai (China) was ranked first with loading cargo traffic by 29 million Twenty Equivalent Units (TEUs).

Reforms in the maritime sector will affect the cost of the transaction in Indonesia. In line with the static analysis of the benefits of trade, when the transaction costs of trading down it will have an impact on productivity increasing. This condition will affect sectoral variables and further will affect macro-economic variables. Relating to the above, it will be relevant to do a research about the Impact of increased productivity in the maritime sector on macroeconomic and sectoral Indonesia.

## METHOD

GTAP database used is the latest version that is 8<sup>th</sup> version, licenses for Department of Economics FEM IPB - Bogor Agricultural University, Multiple Academic License No.8.0-2006 published in 2012 with the aggregation of 129 countries and 57 sectors. 8<sup>th</sup> version uses two years base that is 2004 and 2007. According to Kusumastanto (2014), maritime sector is fisheries, oil and gas, as well as marine transportation services. In this study, the assumption of an increase in productivity occurs only in Indonesia in the maritime sector which is defined in three sectors of the GTAP namely fish (fsh), oil (oil), gas (gas), and sea transport (wtp). This study aggregates 14 sectors and 23 regions.

Region disaggregation is based on the countries which are members of ASEAN with the exception of Brunei, Myanmar and Timor Leste which are in the data 8<sup>th</sup>

version GTAP incorporated in the Rest of Southeast Asia and APEC member countries except China and Papua New Guinea because GTAP database does not accommodate this country. This study analyzes the impact of increased productivity in the maritime sector on the macro and sectoral economic using CGE model of multi-sector and multi region. The consideration of the use of GTAP is in future the interaction between economic actors becomes complex and difficult to understand with a partial equilibrium model, so that the use of CGE considered more appropriate. General equilibrium model is able to capture and provide information that is more in seeing a change in economic variables to other variables compared with partial equilibrium models. In addition, the general equilibrium approach is believed to be better in analyzing inter sectoral link ages, well as macroeconomic conditions. Moreover, it is also suitable for analyzing issues on the foreign trade policy as stated by De Melo (1988) and Yeah et al. (1994).

## **RESULT AND DISCUSSION**

### **Maritime Sector Productivity Improvement Impact on the Performance of the Indonesian Economy**

Maritime sector is one of government priorities in period 2014-2019. Various efforts were made to improve the maritime sector performance. In this research effort is equivalent to an increase in productivity in the maritime sector so that simulated an increase in productivity in sub-sectors, namely maritime fisheries sub-sector, oil and gas, and marine transportation. The impact of increased productivity will be reviewed based on macroeconomic and sectoral perspective, which will be described as follows:

#### **Impact on Macro Economics**

In a macroeconomic perspective, predictive analytics as a consequence of increased productivity in Indonesian maritime sector can be indicated for a change in direction and magnitude of key macroeconomic variables. The level of welfare in thousand USD (using a proxy of Equivalent Variation), output at the national level (using a proxy of real GDP), aggregate trade performance shown by the trade balance are variables that become focus at the level of analysis in the macroeconomic level.

Table 2 presents the impact of increased productivity in Indonesian maritime sector on the welfare of both Indonesia and Indonesia's trading partners in ASEAN and

APEC. Welfare increases because of the increase in productivity in the maritime sector will lower the cost of production (production efficiency). Low production cost affects the prices of goods and services. This condition leads to an increase in the welfare of the producers due to increased efficiency and also the welfare of the consumers because it pays the price of goods and services that is lower than his willingness to pay.

**Table2. Impact of Increased Productivity in Indonesian Maritime Sector on Welfare (000 US \$)**

Country	Equivalent Variation (000 US \$)		
	SIM 1	SIM 2	SIM 3
Indonesia	5160.6	14369.15	22537.45
Malaysia	-113.79	-322.99	-514.25
Philippines	4.03	13.43	23.74
Singapore	71.29	210.93	346.98
Thailand	86.63	259.9	432.93
Viet Nam	-50.55	-145.24	-231.34
Cambodia	1.65	4.3	6.43
Lao People's Democratic Republ	-0.18	-0.56	-0.94
Rest of Southeast Asia	-77.85	-223.56	-361.64
Australia	64.16	181.32	280.48
New Zealand	14.54	44	73.16
China	191.46	559.04	913.89
Hong Kong	30.44	87.21	139.06
Japan	555.26	1698.92	2878.3
Korea	243.23	743.41	1257
Mongolia	1.48	4.15	6.56
Canada	-221.96	-641.07	-1031.33
United States of America	1001.12	2960.55	4856.73
Mexico	-129.47	-380.49	-621.57
Chile	27.1	77.36	123.74
Peru	8.77	25.09	40.24
Russian Federation	-1078.94	-3149.31	-5112.99
RestofWorld	-1258.03	-3642.84	-5856.74

Information:

SIM 1: Increased productivity for maritime sector by 10%

SIM 2: Increased productivity for maritime sector by 30%

SIM 3: Increased productivity for maritime sector by 50%

Increased productivity in the maritime sector will produce 'triangle gains' in producer and consumer surplus associated with efficient allocation and redistribution effect. Producer and consumer surplus in CGE analysis is measured by the increase in

EV (Equivalent Variation). The highest impact on the welfare improvement is in the SIM 3 because productivity increases 50% from baseline. Whereas the lowest impact occurs in SIM 1 simulation considering this is the lowest increase in productivity that is equal to 10%. In addition to impact on improving the welfare of Indonesia, Indonesian maritime sector productivity improvements also affects in increased welfare of Indonesia's trading partners in ASEAN and APEC. For the ASEAN region, welfare of almost all ASEAN countries increases both in simulations 1, 2, and 3 except Malaysia, Vietnam, Laos and The Rest of Southeast Asia. Whereas for the APEC region, almost all countries are also increasing their welfare in simulation 1, 2, or 3, except Russia, Canada, Mexico and the ROW. Increased productivity in the maritime sector in the sub-sector of fisheries, oil and gas, and marine transport modes will have an impact on increasing the output of Indonesia in the maritime sector with more competitive prices that will impact on the increase of export. Consumer in the Indonesia's trading partner country will have many choices for consumption. Output Indonesian maritime sector is not only the consumption of final goods, but also intermediate goods.

Increased output of the maritime sector as a result of the increase in productivity will provide benefits for the countries that use the Indonesian maritime sector input. The increased productivity in the services sector of maritime transport will also increase the flow of incoming and outgoing Indonesian trading. The efficiency of the transportation costs will increase trade volume. This condition is in line with Limao and Venables (2000). Limao and Venables (2000) stated that a reduction in transport costs of more than 10% will increase the trade volume of more than 20%. But for some ASEAN countries, increased productivity of Indonesian maritime sector will have an impact on the decline in real GDP shown in Table 3, and also welfare as described above, namely Malaysia, Vietnam, Laos, Rest of the Southeast Asia and for the APEC region such as Japan, Canada, Mexico and Russia.

Besides Singapore port, one of the main ports in ASEAN are Port Klang and Tanjung Palepas in Malaysia. Because of the increased productivity of the maritime sector including sub-sector of marine transportation services (business shipping, stevedoring and warehousing business harbor, waiter agency business both international and domestic) will shift the role of Port Klang and Tanjung Palepas Malaysia. This condition will decrease real GDP of Malaysia and have an impact on the



welfare of Malaysia. Ho Chi Minh City Port in Vietnam which is one of the main ports in Southeast Asia will also be shifted with the increased efficiency of service ports in Indonesia. Figure 1 shows the main ports in Southeast Asia.

Until now, the Port of Shanghai (China) is ranked first, followed by Ningbo-Zhoushan (China), Singapore, and Rotterdam (the Netherlands). Belawan port that has capacity of 1.2 million TEUs will be developed to 2 million TEUs. The Port of Tanjungsauh (Batam) is targeted 4 million TEUs. The Port of Tanjung Priok (Jakarta) that has a capacity of 3.4 million TEUs will be developed to 6 million TEUs. Tanjung perak (Surabaya) becomes 1, 3 million TEUs. The Port of Makassar will be increased from 550 thousand TEUs to 1.1 million TEUs. Sorong port is targeted 700 thousand TEUs. If the development is successful, the six ports will have a capacity of 15.1 million TEUs and are expected to shift the position of the port of Rotterdam (Netherlands). The capacity will increase if the port of Kuala Tanjung (Sumatra) that is targeted capacity of 22 million TEUs is added to this group.

**Tabel 3. Impact of Increased Productivity of Indonesian Maritime Sector on Real GDP (%)**

Qgdp	SIM 1	SIM 3	SIM 4
Indonesia	1.17072	3.30557	5.25534
Malaysia	-0.0009	-0.00235	-0.00348
Philippines	0.00002	0.00009	0.00015
Singapore	0.00133	0.00389	0.00632
Thailand	0.00253	0.00774	0.01309
Viet Nam	-0.00426	-0.01314	-0.02198
Cambodia	0.0042	0.01148	0.01765
Lao People's Democratic Republ	-0.00065	-0.00201	-0.00342
Rest of Southeast Asia	-0.01636	-0.04669	-0.07547
Australia	0.00182	0.0052	0.00813
New Zealand	0.00133	0.004	0.0066
China	0.0004	0.00088	0.00113
Hong Kong	0.00001	0.00002	0.00004
Japan	-0.00018	-0.00038	-0.00044
Korea	0.00032	0.00115	0.00211
Mongolia	0.00283	0.00794	0.01255
Canada	-0.00085	-0.00241	-0.00384
United States of America	0.0002	0.00065	0.00113
Mexico	-0.00461	-0.01353	-0.0221

Chile	0.00102	0.00289	0.00457
Peru	0.00009	0.00033	0.00061
Russian Federation	-0.04552	-0.13321	-0.21693
Rest of World	0.00026	0.00075	0.00124

For the APEC region, Japan is one country affected by increased productivity of Indonesian maritime sector. Real GDP of Japan will decrease. Increased productivity in the maritime sector, especially in the fisheries sub-sector leads to increased exports of fishery sub sector of Indonesia to Japan. These conditions reduces demand of Japanese society (domestic) or other states to the Japanese fisheries sub-sector (domestic production). As known, Japan and Indonesia are the largest producer of capture fisheries in the world. Indonesia is ranked as the third position in the world capture fisheries production, while Japan is ranked as the fifth position.

**Table 4. The impact of Increased Productivity of Indonesian Maritime Sector on Trade Balance (Million US \$)**

Country	SIM 1	SIM 3	SIM 4
Indonesia	4.28	287.1	781.88
Malaysia	-58.59	-167.63	-268.52
Philippines	8.89	24.5	38.24
Singapore	15.48	45.19	73.66
Thailand	-25.91	-78.92	-133.11
Viet Nam	17.97	51.68	82.97
Cambodia	-0.31	-0.72	-0.96
Lao People's Democratic Republic	0.37	1.07	1.72
Rest of Southeast Asia	-20.91	-59.68	-96.09
Australia	-14.85	-42.57	-62.76
New Zealand	0.46	0.75	0.81
China	158.86	446.81	707.22
Hong Kong	9.24	25.49	39.89
Japan	-285.95	-935.39	-1666.64
Korea	-47.54	-157.11	-281.46
Mongolia	-0.01	-0.01	0
Canada	54.64	157.35	254.34
United States of America	7.43	-24.84	-87.79
Mexico	19.91	55.43	87.5
Chile	7.67	21.56	34.1
Peru	4.73	13.38	21.25
Russian Federation	-348.9	-1016.65	-1647.55
Rest of World	493.03	1353.2	2121.28

Increased productivity in Indonesian maritime sector has an impact on improving Indonesia's trade performance as indicated by a positive trade balance (see Table 4). In the simulation 1, 2, and 3, the trade balance increases in the same direction but with different quantity in accordance with the increase in productivity simulations performed. Improved regulation and improvement of infrastructure facilities at the port will provide an incentive for manufacturers to improve the supply. Output of the maritime sector will increase. Excess supply in the domestic market will encourage increased exports. In addition, output in other sectors related to the maritime sector will also increase. This condition can be understood. When productivity of maritime sector in particular sub-sector of marine transportation services increases, then the flow of trade and other service sectors including tourism will also increase. Tourists do not just pay the ticket price, but also spend money for hotels, taxis, etc., as well as contribute to the development of trade. Marine transportation services transport more passengers to spend more money for food services and other supporting services. Therefore, growth in the industrial/support services results in an increased need to travel. Increased marine transport services sector trade will encourage "virtuous circle" or virtuous circle. This result is in line with Wilson et al. (2003). The research results indicate that 'port efficiency' has the largest elasticity among the trade facilitation indicators. This suggests that the greatest gains to intra-APEC manufactures trade would come from improvements in this trade facilitation area. Fink, Mattoo and Neagu (2002) also support this finding in the context of maritime-based trade.

Countries that increase in real GDP as a result of increased productivity of Indonesian maritime sector will also consistently increase export performance. The increase of export performance will encourage positive trade balance as the Philippines and Singapore. Conversely for country that real GDP declined, the trade balance also decreased as Malaysia and Rest of the Southeast Asia. Some countries are experiencing an increase in real GDP, but its trading performance decreases as Thailand and Cambodia, and conversely there are some countries that real GDP declined but the trade balance has increased as Vietnam and Laos. This condition shows that the relative trade is not a dominant contributor to real GDP in Vietnam and Laos. Increased trade balance does not increase real GDP. Thailand is among the countries that suffer the decreased trade balance. Thailand is also a producer of capture fisheries sub-sector,

and has a harbor which is one of the main ports in Southeast Asia, namely the Port of Laem Chabang. Increased productivity of Indonesian maritime sector will shift roles of Thailand to supply the fishing sector and the provision of marine transportation service so that Thailand's trade balance tends to negative.

### **Sectoral Economic Impact**

In a sectoral perspective, predictive analytics as a consequence of the change in productivity may be indicated by the relationship and the magnitude of the key variables in the economic sector shown in Table 9. Output, exports and imports at the sectoral level are a series of variables that are the focus at the level of analysis at sector level. Increased productivity in simulations 1, 2, and 3 in the maritime sector, namely the sub-sector of fisheries, oil and gas and marine transportation service sector will increase its own output in the maritime sector. The highest increase in output successively occurs in the sub sectors of gas, petroleum, fisheries and marine transportation services. In addition to maritime sub-sector, other sectors that increase in output are meatLstk (aggregation of Cattle, sheep, goats, horses; Animal products nec; Raw milk; Wool, silk-worm cocoons; Meat: cattle, sheep, goats, horse; Meat products nec) and other service sectors such as utility construction (aggregation of Electricity; Gas manufacture, distribution; Water; Construction), other transportation dan communication (aggregation of Trade; Transport nec; Air transport; Communication) dan other services (aggregation of Financial services nec; Insurance; Business services nec; Recreation and other services; Pub Admin/Defence/Health/Educat; Dwellings).

**Table 5. The Impact of Increased Productivity on Indonesian Sectoral Output (%)**

<b>Sector</b>	<b>SIM 1</b>	<b>SIM 2</b>	<b>SIM 3</b>
Fish	4.80759	13.44899	21.25149
Oil	12.12584	36.7428	61.64254
Gas	13.10684	39.00912	64.63914
Water Transport	2.31944	8.08289	15.81253
Grain Crops	-0.28042	-0.77781	-1.20487
MeatLstk	0.16743	0.4803	0.78491
Other Extraction	-1.00192	-2.8041	-4.42769
Proccessing Food	-0.09118	-0.55667	-1.12817
TextilWapparel	-3.76694	-9.79859	-14.53793
Light Manufactures	-1.19687	-3.29194	-5.11329

Heavy Manufactures	-0.86292	-2.73428	-4.70728
Utility Construction	1.10484	2.92783	4.4073
Other Transportation Communication	0.07313	0.22111	0.38252
Other Services	0.64256	1.84593	2.95746

Increased productivity of the fisheries sub-sector of Indonesia does not necessarily increase output such as food processing sector primarily made from raw seafood. Most of the export of Indonesian fishery products are fresh or frozen fish. This condition causes a shortage of raw materials in the food processing sector thus decreasing output. Related to this finding, government during 2014-2019 should build a fish processing industry in the area of fisheries resources that should get support. This step will increase the added value in the fisheries sub-sector that will improve performance and increase foreign exchange trading countries.

**Table 6. The Impact of Increased Productivity on Sectoral Exports of Indonesia (%)**

Sector	SIM 1	SIM 2	SIM 3
Fish	36.3126	111.265	186.369
Oil	36.4053	118.862	209.081
Gas	18.1204	54.0117	89.5928
Water Transport	37.4244	140.264	287.274
Grain Crops	-4.5231	-11.673	-17.414
MeatLstk	-7.0617	-18.421	-27.39
Other Extraction	-1.6626	-4.4628	-6.8126
Processing Food	-1.7039	-5.8786	-10.256
TextilWapparel	-6.4135	-16.694	-24.774
Light Manufactures	-4.8975	-13.206	-20.159
Heavy Manufactures	-2.0987	-6.4404	-10.842
Utility Construction	-4.9471	-13.075	-19.661
Other Transportation Communication	-5.0244	-13.21	-19.76
Other Services	-6.366	-16.383	-24.105

The increase in output in some sectors as a result of an increased productivity as shown in Table 5 does not necessarily increase exports in accordance with the theory. Increased export occurs only in the maritime sector (sub sector of fisheries, oil, gas and marine transportation services). The big impact of the increase in output is just able to boost exports, while the sector that has relatively small increase in output is not able to increase exports even decrease. The decrease of output in other sectors such as grain crops, other extraction, food processing, textile wapparel, light and heavy manufactures is a result of increased output in the maritime sector,

which tends to be exported. Other sectors that use raw materials from maritime sectors such as fisheries, oil, and natural gas will experience a shortage of raw materials. These condition sresult in a decrease in output and impact on the decrease in exports. The high increased productivity in maritime transportation services sector boosts imports that are relatively higher than exports (see Table 6). Increased imports causes domestic sector that is not competitive to be depressed, so output ande xports decrease. Consistent with the theory that the sector increased its output tends to decrease imports. This condition happens in maritime sector (fish, oil, gas, and water transport). Increased productivity that increases exports of transport services is indicated to increase imports several other sectors. Increased productivity of marine transportation services sector is more responded with an increase in imports than exports, because marine transportation services is the dominant mode of transport in international trade. Detail is shown in Table 7.

**Table7. The Impact of Increased Productivity on Sectoral Imports of Indonesia (%)**

Sector	SIM 1	SIM 2	SIM 3
Fish	-15.1548	-33.3407	-44.0443
Oil	-11.9964	-28.7219	-39.7823
Gas	-12.6724	-32.5035	-47.9807
Water Transport	-13.6786	-33.241	-46.3616
Grain Crops	1.3451	3.62515	5.68788
MeatLstk	3.77335	10.80482	17.44359
Other Extraction	1.8879	5.04315	7.65684
Proccessing Food	1.32895	4.23767	7.26835
TextilWapparel	-0.41268	-0.87882	-1.02667
Light Manufactures	2.21447	6.3459	10.24008
Heavy Manufactures	0.54554	1.69905	2.93331
Utililty Construction	3.3502	9.37685	14.82164
Other Transportation Communication	3.11471	8.85355	14.17509
Other Services	3.14887	8.8041	13.89942

## CONCLUSION

Based on the results of CGE analysis, simulations of an increase in productivity (by 10%, 30%, and 50%) in the maritime sector (the sub-sector of fisheries, oil, natural gas, and marine transport service sector) have a positive impact on welfare as measured by equivalent variation, real GDP, and the trade balance of

Indonesia. Nevertheless, in the sectoral this condition is not followed by an increase in output in all sectors that inline with the aggregation in this study. The sectors that increase in output are maritime sector, and other sectors such as meatLstk and other service sectors such as utilities construction, transportation and communications companies and other services. While the sectors that decrease in output are grain crops, other extraction, food processing, textile wapparel, light and heavy manufactures. The sector that increases in output such as maritime sectors is consistent with the theory. Exports in maritime sectors also increases, while imports decreases.

To improve the performance of maritime transportation services, increasing productivity is not enough, the quality of export infrastructure such as ports and appropriate regulation should increasingly improver in an attempt to penetrate the export markets of ASEAN and APEC region. Seaports and maritime traffic management need upgrading to provide sufficient capacity so as not to inhibit the growth of demand for maritime transport. Besides that, the policy and regulatory support is needed to improve access to markets.

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